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STRATEGY RESEARCH PROJECT

GLOBAL REACH? AIR FORCE CAPABILITIES FOR LONG-RANGE ATTACK

BY

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ABSTRACT

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Though bombers have a long Air Force legacy, their declining numbers, long association with nuclear deterrence, and sometimes limited conventional warfighting capabilities have cast their future role in doubt. The coming decade's unique security environment combines with budgetary pressure to justify serious scrutiny of national requirements for the future of the bomber force. However, the B-1, B-2, and B-52 bombers do offer long-range power projection capability well suited to a post cold war strategy to prevent, deter, or win in a broad array of scenarios. Offering true "global reach," bombers provide the theater commander unequaled capability for long-range, large payloads, responsiveness, and endurance while employing standoff and precision munitions. Though their role in the cold war, Vietnam, and Desert Storm may be instructive, it has more often limited concepts and doctrine for their employment. Ongoing modernization of today's small bomber force and of advanced munitions must continue and be adaptive to ensure their utility. For the future, fresh thinking is required for bombers to be completely integrated with other instruments of land and sea-based airpower to provide wide utility, flexibility, and synergistic effects across the spectrum of war.

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> Power projection forces focus on increasing their ability to provide initial response and sustained firepower for an air campaign in any theater. Long-range bomber forces have unmatched potential to provide both.
>
> *Global Reach Global Power*, 1992

Air Force bombers have a legacy as old as the conceptual basis for airpower doctrine itself, but in a post-cold war world marked by uncertainty, changing threats, and declining defense spending, do they still have a role? The purpose of this paper is to consider the relevance of the long-range bomber force, B-52, B-1, and B-2, to national and theater requirements in the context of the changing security environment. The discussion that follows begins by reviewing the expected challenges of the multipolar world and its strategic requirements, examines contemplated missions for bombers, and arrives at a conclusion that these aircraft do offer unique value to future scenarios around the globe.

Obtaining maximum leverage from the small bomber force of the future means adopting fresh operational concepts and increasing integration of all long-range attack forces: manned and unmanned, land and sea-based. Bomber and weapon modernization are funded today and underway, but still face challenges to ensure the doctrine, training, and equipment remain equal to their tasks.

The National Security Environment: Strategy and Requirements

The end of the bipolar world resulted in greatly diminished overseas presence, heightened conditions for regional conflict and unrest, but continued (or expanded) international responsibilities through a policy of engagement and enlargement. Forces responsive to that strategy must be mobile, or expeditionary in nature--that is, able to project power, perhaps across great distances and with little warning, against a widening variety of increasingly lethal threats. In 1996, the Chairman of the Joint Chiefs of Staff issued "Joint Vision 2010[1]," challenging the services to adopt new operational concepts--dominant maneuver, precision engagement, full dimensional protection and focused logistics to achieve full spectrum dominance--from peacetime engagement, to deterrence, to winning the nation's wars.

Dominant maneuver will require strike aviation that can synchronize with joint forces to outpace and outmaneuver any adversary, placing emphasis on massing effects rather than forces.[2] This is a concept suited to aerial long-range attack, as is precision engagement. In the words of the Joint Warfighting Center, precision engagement "generates desired effects in time and intensity by providing responsive and accurate attack over extended ranges while minimizing unwanted collateral damage."[3] The next concept, full dimensional protection, is afforded to bombers through their inherent ability for ranging from the rearmost bases--where survivability can be best assured. Likewise, aerial forces expose only a relatively small number of warfighters to harm's way. They also deliver wide- scale and lethal, yet discriminant fires, without requiring the combat

engagement of large bodies of friendly forces. Finally, to achieve full spectrum dominance, long-range attack aircraft like all other weapon systems, must be made more mobile and sustainable--translating to affordable modernization while not neglecting provisioning of spares and deployability, or "focused logistics."

"Joint Vision 2010" promotes a common view of the future to the services and commanders of the unified commands to assess options and evaluate alternatives. The smaller force structure of the future will require proven, multi-mission utility for joint war-fighting and be more fully interoperable. The Air Force answered the new imperatives with the vision paper, "Global Engagement,"[4] spelling out core competencies of air and space superiority, global attack, rapid global mobility, precision engagement, information superiority, and agile combat support. Within this structure, from senior joint staff direction to the services' concepts, weapon systems unable to promise substantial value are likely headed toward prompt retirement or cancellation.

Significant changes to defense programming priorities could also result from future revision of the National Security Strategy and National Military Strategy, which many expect could occur coincident to the 1997 Quadrennial Defense Review--"an all-encompassing reexamination of the defense program and how it relates to both current strategic demands and the projected fiscal environment."[5] For example, a shift of emphasis to operations other than war and a retreat from a force sized to confront two nearly simultaneous major regional contingencies might dictate deeper reductions to conventional war-fighting force structure. In such a case, funding will likely follow those programs contributing most broadly across the spectrum of conflict. Achievement of

greatest savings would also be realized by the elimination of entire units and major weapon systems rather than their piecemeal reduction.

In the environment just described, where peacetime engagement is the focus, the Air Force requirement for bombers--their roles, numbers, and types--necessarily comes under serious review. Spawning much study over the last decade, the dearth of analysis published to date still lacks consensus between staffs in the Office of the Secretary of Defense, the Air Force, and Capitol hill.[6] The bomber debate becomes further obscured by contractor and congressional sympathies for favored weapon systems and a cold war mind set, still prevalent, regarding true bomber capabilities.

Air Force Planning for National Requirements

At present, national strategy and Air Force plans appear to hold the line on further cuts to long-range bombers. By 1995 the bomber force had already been reduced to 44 percent of what it had been during the waning days of the cold war.[7] The 1990 Air Force vision document, "Global Reach Global Power,"[8] spurred adjustments, recognizing an increasingly home-based force was now more dependent on rapid power projection and could exploit bomber characteristics of range, payload, and responsiveness. Another source of direction, the Presidentially approved 1993 Department of Defense Nuclear Posture Review (NPR),[9] a follow-up to the Bottom-Up Review, subsequently influenced all national strategy documents to include bombers in a survivable triad of nuclear

deterrent forces, seemingly ensuring a role for some number indefinitely.[1] Notable, is that among the triad weapon systems to include ground based intercontinental ballistic missiles and submarines carrying ballistic missiles, bombers are almost uniquely useful along the full spectrum of conflict.

Regarding the conventional use of these aircraft, Air Force programming specifics maintain the course set by Secretary of the Air Force Donald B. Rice in the 1992 "Bomber Roadmap."[10] Currently, the FY 97 Air Force and Department of Defense position reemphasizes this methodical plan for the bomber concept of operations, system modernization, and mating of new precision and standoff weapons as key components among the service's mid-term priorities.[11] For such plans to remain relevant, it is necessary to review the options and value these weapons bring to national military strategy.

Long-Range Attack: From the Beginning

"...the basis of air force power is the bombardment airplane..."
"Billy" Mitchell

Airpower theory looks to three "prophets" for its inspiration: Douhet, Mitchell, and Trenchard. Italian General Giulio Douhet became influential through his book, "Command of the Air" published in 1921.[12] Douhet saw land warfare as forever changed with the advent of the airplane and viewed airpower as inherently suited to the offense.

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[1] The NPR called for a Strategic Arms Reduction Treaty (START I and II) compliant force of 500 single warhead MMIII ICBMs, 14 Trident II submarines with multiple warhead missiles, and a bomber force of 66 B-52s and 20 B-2s. The entire B-1B fleet will be conventional (non-nuclear) only.

He boldly predicted shortened wars through highly lethal aerial attacks against a nation's vital centers. General William "Billy" Mitchell, the American interwar proponent of a separate service, championed aviation as key to national power. An early advocate of multiple air missions (observation, pursuit, bombardment...), by the 1930s he became increasingly convinced of the strategic effects possible through long-range bombing. Mitchell was an early "student" of British General Hugh M. Trenchard, "father of the Royal Air Force." Commander of Britain's "Independent Air Force," Trenchard was tasked with long-range bombing at the end of World War I, and he was influential in voicing the offensive capability of airpower through strategic bombing and the interdiction of land, sea, and air forces.

By 1935, the U.S. Air Corps Tactical School had adopted much from the "prophets" in what may be summarized in the following propositions:[13] Airpower would be the most decisive instrument in war and bombardment was the dominant form. The most effective strategy called for attacks against economic infrastructure and warmaking capacity. Attacks would thus be conducted against key industries, with pinpoint accuracy, well beyond enemy lines, by heavily armed, unescorted bombers. Many concepts argued today are yet rooted in this body of ideas that embrace the range and power of the air weapon.

The timeless qualities sought in long-range bombers are their unique attributes of intercontinental range, large payloads, and responsiveness over time and distance to any trouble spot. Though not the ubiquitous "battle planes" of Douhet's theory, examples of bombers' multi-mission adaptability can be critically derived from pre-cold war use,

before the singularly dominating mission of strategic nuclear delivery. Conceived of at the beginning of manned flight, experimented with in the first world war, and much debated between the world wars, bombers played a significant part in World War II. Then, in addition to the strategic bombing of industrial centers, bombers supported the ground war through the interdiction of transportation and direct attack of fielded forces, while also supporting maritime operations with reconnaissance, anti-submarine warfare, ship attack, and minelaying.

However, after August 1945, the bomber began a long association with nuclear weapons, in spite of important burdens carried in conventional bombing during America's wars in Korea, Vietnam, and Southwest Asia. In 1982 the British suddenly realized the need for long-range power projection over the Falkland Islands--4,000 nautical miles from their nearest available base at Ascension Island. In the longest such combat missions flown to that date, the Royal Air Force hastily flew strikes that demonstrated the need and potential of long-range airpower. Opening Desert Storm in 1991, B-52s would fly over 14,000 nautical miles on a 35 hour, non-stop mission from a continental U.S. (CONUS) base to deliver 35 AGM-86/C air launched cruise missiles on Iraqi air defense targets.[14] Though the spotlight would remain on stealth and precision in the Gulf air war, B-52s hauled 27,500 tons of weapons to their targets--over one-third of all bombs dropped in the war.

Throughout the cold war, bombers were understood for their ability to bring force to almost any target, regardless of distance. That capability should be similarly prized in the future, to give access to parts of the world no weapon other than a missile can reach.

The Air Force and Navy inventory of strike aircraft has also been reduced, and the retirement of all F-111s and A-6s left a profound gap in our ability to hit deep targets. Moreover, the diminishing likelihood of having sufficient forward deployed force--from land-based fighter bases or Navy carrier battle groups--to respond to crisis, adds to the value of bombers ready to react directly from the United States mainland. Though bombers admittedly offer only "over the horizon presence," this quality has its advantages, and when adequately understood by potential opponents, can prove useful as a deterrent to hostilities.

Long Range Attack: From Deterrence to Waging War

In the earliest stages of conflict, bombers could be armed, placed on alert status, and that intention carefully publicized (e.g., CNN) to deter aggression. Another "show of force" measure to achieve the same effect, includes deploying aircraft forward, either singly, or as part of a tailored, larger air expeditionary force, as a strong signal of resolve. Measured additional steps could include "airborne alert," or the visible exercising of long-range forces in the vicinity of a trouble spot. Even today, "global power" training missions can be, and are routinely, flown from the United States to any region of interest in the world to demonstrate, and train for, power projection capability during crisis.

At the next level of conflict, bombers might be used in limited strikes, raids, or "lesser regional contingencies" to include direct counter-terrorist action, capitalizing on their speed and very long-range. The theater commander could call on a strike force

directly from the CONUS, avoiding politically sensitive forward basing, though dependent on air refueling. Likewise, bomber missions should join naval forces, where possible, to add their mass to an attack while counting on carrier aviation counter-air and electronic combat support to negate enemy defenses.

The B-2 could make any such strike covertly and unescorted, limited only by air refueling, flying undetected until weapon release. A comparative example is the successful 1986 Libya raid which relied on extensive joint forces, but in 1998 could be more precisely and discretely conducted by only six air-refueled B-2s.[15] Another alternative, new to this decade, employs B-52s avoiding overflight of all threats, striking with standoff weapons. B-52s flew just such a mission in September 1996 nicknamed, "Desert Strike," sending air launched cruise missiles against Iraqi targets much as they did in the opening hours of Desert Storm.

However, the most complete use of bombers remains toward the high intensity end of conflict. Though most useful when they prevent and deter aggression, they are key components to any theater commander's conventional war operations plans (OPLANs). As an example, bombers play important roles in each of the following typical campaign plan phases: 1) Halt the invasion, 2) Build up combat power in-theater while reducing the enemy's, 3) Decisively defeat the enemy, and 4) Provide post-war stability.[16]

Much of the post-cold war interest in long-range aviation stems from the reduced forward presence of American forces and the potential responsiveness of bombers to short-warning conflicts. Responding immediately with massive firepower in the opening

hours and days of hostilities, they can help blunt an invading army and buy time as other allied forces begin deployment to the theater. The promptness of bombers can act as a hedge against failure to deploy other attack aircraft early enough, or when political events preclude timely forward basing. The importance of quick reaction is that the failure to stop advancing armored forces early can result in an ally's futile defense, the loss of valuable territory and equipment, and then having to respond later with a broader counteroffensive to dislodge a dug-in opponent. Though no simple task, the destruction by air of ground forces, such as mechanized units in road march, proves lucrative during this time of unique vulnerability--while they traverse lines of communication, especially when constrained by chokepoints.

A 1992 RAND study suggests only bombers have the potential range and firepower that make them uniquely capable to counter an armored invasion during the critical early days of a conflict.[17] Their model found that a force of 20 B-2s might be sufficient to destroy an armored division per day under the right circumstances. The 1993 Bottom-Up Review made such a scenario, halting an invasion, among the tasks required of U.S. forces.[18] By 1994, presenting their findings to the Senate Armed Services Committee, RAND postulated that "heavy bombers could be the *only practical option* in some cases of interest, which means they could fill *a unique niche* in U.S. military capability." [emphasis theirs][19] The annual report by the secretary of defense to Congress also cited the importance of force enhancements "to bring a large amount of firepower to the conflict in its opening stages and quickly halt the aggression. In most cases, if U.S. forces can accomplish this critical objective promptly, it is far more likely

that objectives in later phases of the conflict... can be achieved sooner and at less cost and risk."[20] Range and responsiveness allow promptness in the attack of high-value targets, rear area lines of communication, and the disruption and destruction of advancing enemy ground forces.

A bomber force structured to confront the most stressful contingency of the early phase of conventional war, is then capable across a "full spectrum of other contingencies."[21] After initial CONUS-based strikes, bombers could operate from secure bases at the periphery, or outside, the area of operations--beyond the greatest threat from ballistic missiles or weapons of mass destruction. (For example, bombers based in either the continental United States, Guam, or Diego Garcia could attack likely areas of interest with a single air refueling.) Shifting from an initial response force, bombers would lend weight to a counterattack phase of a campaign, and their range would also lend them to being the "swing" force to respond elsewhere on the globe in the event of a second crisis.

The complementary bomber mix allows B-2s to directly attack high value, heavily defended targets, B-1s in greater numbers to be force packaged with fighter and other air assets against a wide array of medium-threat targets, and B-52s to directly attack targets where air superiority exists, or employ standoff munitions at a safe distance from high-threat areas. In the earliest days or hours of combat, if E-8 Joint Surveillance Target Attack Radar System (JSTARS) aircraft are unavailable, which would be probable, the B-2, taking advantage of stealth and on- and off-board sensors might act as a battle management platform providing situational awareness and targeting of following bombers like the B-1.[22] The B-2 might also act in the defense suppression role for the

more vulnerable follow-on aerial forces.[23] As fighters become available for support, or as local air superiority permits, a theater commander can also draw on the bomber's capability for long loiter time, remaining on station to exploit and attack emerging targets as the tactical situation changes. Long endurance over the battlespace is a quality not enjoyed by other platforms and bombers must adapt emerging information technologies to realize their potential. The combination of bombers on missions integrated with other aircraft is nothing new, and the likeliest employment option, is today commonly referred to as "composite force packaging."

Another solution to the bombers' requirements for support early in the fight can be met by the resources of the carrier battle group (CVBG). Itself, frequently lacking adequate long-range attack aircraft with a sufficiently powerful punch, the CVBG offers excellent forward positioned command and control and combat support. The synergy of such a joint operation offers unity of effort to make possible the accomplishment of a critical task, blunting an armored invasion, otherwise impossible through the independent actions of either force against some threats.[24] Bombers have additional maritime capability that can add to the fleet's flexibility through wide ocean surveillance/ reconnaissance, mining, and, specific to the B-52, anti-ship missile (AGM-84 "Harpoon") employment. A historical perspective illuminates what bombers offer in joint missions where they alone have the range and payload to accomplish an otherwise non-traditional mission. In "Operation Starvation," a campaign begun in early 1945, Army Air Forces (AAF) B-29s decisively choked Japanese home island shipping by means of concentrated minelaying.[25]

A summary of bomber missions runs from strategic attack (against enemy war making potential) to close air support (against an enemy in contact with friendly forces), interdiction (of troops and supplies distant from the battle), counter-air strikes (on enemy aircraft and facilities), and maritime surveillance and attack.[26] Likely aimpoints might be categorized as mobile, fixed tactical, and strategic targets.[27] Among immediate, mobile targets are advancing mechanized, armored forces or relocatable military equipment such as surface to surface missile launchers. Fixed tactical targets include airfields, warning, command and control sites, and headquarters. Fixed strategic targets include leadership, military production facilities, infrastructure, such as electrical distribution or refined petroleum production. While such targets are not uniquely characterized for attack by bombers, they may be deep and only be vulnerable to very long-range attack, or time critical and not within the reach of any forward deployed weapons.

The nature of likely bomber target sets has taken a direction away from preplanned, static targets to characteristics more dynamic--assets that are mobile, time sensitive, or highly defended.[28] Considering that previous decades stressed bomber missions which were heavily preplanned against fixed targets requires the adaptation of new sensors, communications, and on-board mission planning to the bomber force. It also means using "cooperative tactics" between stealthy B-2s and more vulnerable B-1s integrated into the same missions.[29] In addition to attacking enemy infrastructure or blunting an invasion, early arriving bombers will likely rely on one another to defeat enemy defenses. Thus accomplished, the hallmark of bomber employment in the future

will be flexibility combined with the carriage of large payloads of precision munitions more than the traditional picture of "dumb" bombs raining upon the enemy.

Navigating the Bomber Roadmap

Gone forever are the days when the United States fielded huge bomber fleets, as in 1959 when Strategic Air Command had 1,854 B-47s and B-52s.[30] That command's past mission gave rise to a culture that set it apart from the rest of the service. Even the terms "strategic" and "tactical," while names of major Air Force commands, obscured operational concepts for planning the integrated use of airpower. Air Force Chief of Staff, General Hoyt S. Vandenberg recognized this situation in 1951, but such thinking would dominate for four more decades:

> Air power is indivisible. We don't speak of a "strategic" or a "tactical" Army or Navy, yet those terms constantly are applied to the Air Force. The overriding purpose of every plane, whether it is a bomber or a fighter, is to win the air battle on which final victory on land or sea is predicated.[31]

General O. P. Weyland, Commander of Far East Air Forces at the conclusion of the Korean War, likewise remarked: "[Indivisible airpower] can put at risk all important elements of a national structure. Attempts to classify it by types of aircraft, types of operations, or types of targets have led to confusion and misunderstandings."[32] Much more recently, Air Force Chief of Staff, General Merrill A. McPeak would pronounce, "The era of disintegrated airpower is over."[33] Furthermore, the service's basic doctrine, published in 1992, stated, "Strategic attacks are defined by the objective--not by the weapon system employed, the munition used, or the location."[34]

While fulfilling the exacting cold war demands of nuclear alert until 1991,[2] the bomber force was neither adequately prepared for a leading role in conventional operations, nor could it be promptly tasked by a theater commander. Today's 125 bombers, a part of Air Combat Command since June 1992, include reserve and national guard units, that compose a lean force that conducts aggressive, joint, composite force training around the world and is completely tasked in operational planning.[35]

However, the existing bomber force is reliant on seeing modernization efforts through to completion. Begun under the 1992 Bomber Roadmap and now on the Department of Defense short list of identified "Critical Force Enhancements" are both the long-range bomber program and advanced munitions. [36] Fielding of "next generation" air delivered weapons is essential to keeping bombers useful. At this date, the service has fully funded these programs for conventional modernization.

The GBU-31 Joint Direct Attack Munition (JDAM) will give all-weather, day/night, precision to a 2,000 pound bomb. Procurement of advanced cluster bombs (the CBU-97B/Sensor Fuzed Weapon, or SFW) has begun and provides the antiarmor capability needed to blunt an invading force. "Smart" projectiles in the CBU-97 use infrared sensing to scan a wide area for targets, sending a penetrating warhead through any detected vehicles, or detonating to damage anything in range, should it not find a target.[37] SFW, coupled with the payload of bombers, allows very wide-area, multiple kills on the first pass capability in any weather. A future development will give inertial guidance in a wind corrected munitions dispenser to allow accurate delivery of such

[2] President Bush directed that bombers stand down from their decades of alert readiness on September 27, 1991.

cluster bombs from medium and high altitudes, keeping the delivering aircraft out of range of the most numerous surface to air threats.

The AGM-154 Joint Standoff Weapon (JSOW) will allow distant launching of accurate cluster type weapons with specialized submunitions, including SFW.[38] Both JDAM and JSOW will rely on a combination of inertial guidance and the Global Positioning System to guide to impact. It will remain important to retain ground-moving target indication capability on the B-1B's radar as its avionics proceed through upgrades so that the weapon-bearing aircraft can locate a mobile force, such as the invading army scenario.[39] Finally, the Joint Air-to-Surface Standoff Missile is an Air Force/Navy program to give very long range standoff capability with a 2,000 pound warhead.

All of these independently targeted weapons reverse the consideration for how many sorties are required to strike a target, to *how many targets might be killed per sortie*, since as many as 24 JDAM could be carried on a single B-1. The bomber's payload then translates into a great economy of force instrument--delivering as many precision guided munitions to as many different target aimpoints as otherwise requires six or more fighters, and doing so without the refueling support required of shorter-range aircraft.

Although precision will be essential to full target coverage, use of existing unguided munitions, such as the ubiquitous Mk-82 500 pound bomb, will likely enjoy utility into the indefinite future. Due to avionics refinements, smart tactics, and crew training, the delivery of such less expensive "dumb" bombs can be consistently made to accuracies within a few hundred feet of an aimpoint, from low or even high altitudes.

The nature of the target and the desired effects, along with the more limited inventory and cost of precision weapons, can drive the weapon of choice to the simpler, more abundant munition--aided by large payloads of bombers. In addition to destructive ability, an important effect can be the psychological impact upon the enemy of the massive firepower of bombers. Usually unseen and unheard until the bombs were falling, the surprise and shock effect of B-52 attacks during the Vietnam War and Desert Storm made them among the most feared weapons and significantly contributed to desertions and defections.[40]

In addition to weapons upgrades, bombers must be modified to remain up to date or gain altogether new capability for communications links to national or theater assets for targeting, threat data, and battle damage assessment.

Conclusions

Like other forces and weapon systems, bombers will come under repeated scrutiny to compete for fewer defense dollars in an era of shifting priorities. Bombers have not been well understood in the past, whether clouded by their cold war mission, or only thought of as bomb-carrying trucks to deliver large amounts of ordnance on the jungles of Vietnam or the desert of Iraq. Today, their value requires new thinking, but the foundations of plans set early in the 1990s, including the Bomber Roadmap, remain basically sound and consistent with today's vector from Joint Vision 2010. Bombers

must be understood for their uniqueness as a reasonably low-risk, quick reaction force to precisely deliver massive firepower across the spectrum of conventional conflict.

Fresh operational concepts are necessary to leverage the value of the bomber force. These can be developed today and training conducted with crews on live ranges:

- Increased integration of long-range attack aircraft with naval carrier based airborne warning and control, electronic combat, counterair, and strike aircraft for synergistic effects.

- Coordination among varied bomber aircraft (B-1, B-2, B-52) in the strike role with B-2 battle management of strike forces. (Existing training stresses "force packaging" with fighters, but ironically, dissimilar bombers rarely train together.)

Future national and regional planning should better exploit bomber capability:

- Planning among theater commands and task forces must understand the complete use of airpower resources and complementary attributes of combat systems. Looking to either carrier or land-based fighter assets first may overlook the most powerful instruments for long-range attack or deployment aimed to deter.

Future programming, in spite of fiscal constraints, will need to address the following considerations for bomber forces to be effective:

- Planned weapons and aircraft modernization is essential to future bomber effectiveness. The 1992 "Bomber Roadmap" charted the course for required improvements.

- There needs to be greater consideration for standoff weapons for the B-1 while complying with the challenges of arms control restrictions on carriage of air launched cruise missiles.

- Existing plans do not adequately provision bombers with communication systems to receive national and theater-level, real-time intelligence, command and control, and retargeting.

- Bomber upgrades must remain adaptive to changes in strategy and threats. Requirements for computer system and sensor upgrades may be outpacing "Bomber Roadmap" planned improvements which

originally focused on offensive and defensive avionics, modern munitions, and supportability.

A wise choice for future force structure should consider bomber attributes and the worldwide responsibilities this country chooses as a lone super power. Meeting such "Global Engagement" core competencies as global attack and precision engagement calls for long range attack capabilities. Yet, having the force structure, and even its modernization, is not enough if our concepts for operational employment cannot break free from existing thinking to exploit its advantages and achieve the synergy possible to enable full spectrum dominance.

General Carl Spaatz, first Air Force Chief of Staff, reminded us almost fifty years ago of the global nature of airpower and insisted, "Air strategy begins with airplane ranges."[41] Does the nation still require, and will our strategy call for, the intercontinental range and striking power of a bomber force?

ENDNOTES

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[24] See Michael E McGauvran, Halting the Advance: The Synergistic Effects of Heavy Bombers and Carrier Air (Newport, RI: Naval War College, 1996).

[25] John S. Chilstrom, Mines Away! The Significance of U.S. Army Air Forces Minelaying in World War II (Maxwell AFB, AL: Air University Press, October 1993).

[26] Department of the Air Force, Basic Aerospace Doctrine of the United States Air Force, Air Force Manual 1-1, Vol I (Washington, D.C.: Government Printing Office, 1992), 6-13.

[27] Buchan, Providing an Effective Bomber Force for the Future, 19-20.

[28] Frelinger, 16-18.

[29] Ibid., 30.

[30] Jeffrey Record, Strategic Bombers: How Many Are Enough? (Washington, D.C.: Institute for Foreign Policy Analysis, Inc., 1986), 3.

[31] Hoyt S. Vandenberg and Stanley Frank, "The Truth About Our Air Power," Saturday Evening Post 223, No. 34 (17 February 1951): 21.

[32] O. P. Weyland, "The Air Campaign in Korea," from James T. Stewart, Airpower: The Decisive Force in Korea (Princeton, NJ: D. Van Nostrand Co., Inc., 1957), 30.

[33] Merrill A. McPeak in Correll, "New Flags for the Fighting Forces," Air Force Magazine (April 1992): 30.

[34] Basic Aerospace Doctrine of the United States Air Force, 147.

[35] At the beginning of FY96 the bomber total active inventory (TAI) of 183 aircraft broke down to 84 B-1Bs, 85 B-52Hs, and 14 B-2As. Those considered operational, the "Primary Aircraft Authorized" (PAA) totaled 125. See USAF Almanac, "Aircraft Type, Total Active Inventory, and Primary Aircraft Authorized," Air Force Magazine (May 1996): 55. See also, Buchan, Providing an Effective Bomber Force for the Future, 29.

[36] Secretary of Defense, Annual Report to the President and the Congress ,17-19.

[37] Glenn W. Goodman, Jr., "Tenacious Tank Killers," Armed Forces Journal International (November 1996): 20-22.

[38] USAF Almanac, Air Force Magazine (May 1996): 145. JSOW will have a range of up to 46 nautical miles.

[39] Frelinger, 28.

[40] Stephen T. Hosmer, Psychological Effects of U.S. Air Operations in Four Wars 1941-1991 (Santa Monica, CA, RAND, 1996), xxx.

[41] Charles M. Westenhoff, Military Air Power: The CADRE Digest of Air Power Opinions and Thoughts (Maxwell AFB, AL, Air University Press, 1990), 41.

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